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(12) (19) (CA) **Demande-Application**

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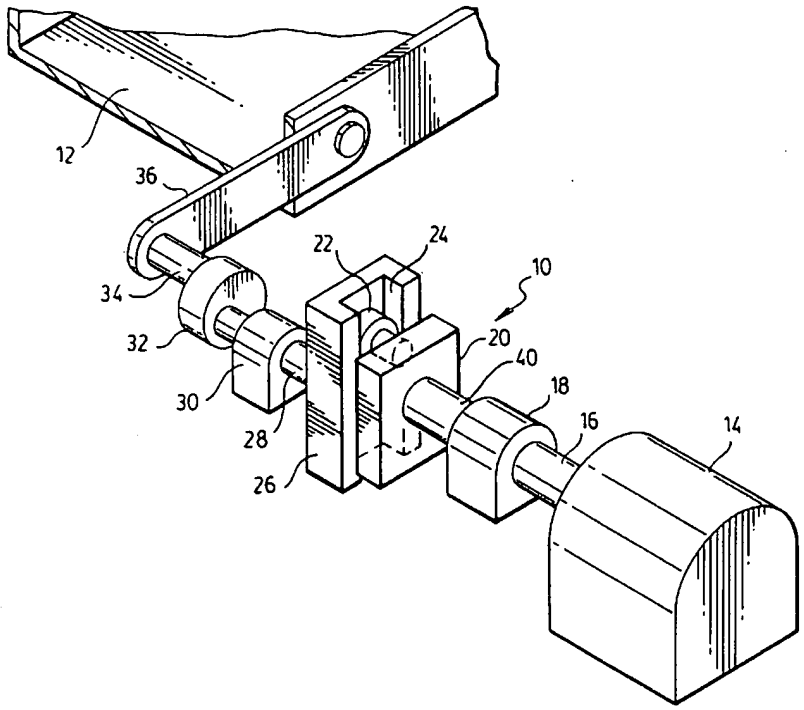
(54) **MECANISME D'ENTRAINEMENT POUR PLATEAU DE SECOUAGE**

(54) **DRIVING MECHANISM FOR SHAKING TRAY**



(57) The driving mechanism has a drive shaft which rotates a driving block. A cam is mounted for rotation to the driving block and is received in a slot of a follower. As the cam rotates, it rolls backwards and forwards in the slot and causes the follower to rotate. A connecting rod is affixed to the follower and is rotated by it. The connecting rod rotates about an axis parallel to, but offset from, the axis about which the drive shaft rotates. The rate of rotation of the drive shaft is unvarying whereas the connecting rod rotates at a varying rate. A crank is affixed to the connecting rod and imparts reciprocating motion to the tray. A link can be substituted for the cam.

ABSTRACTED-PUB-NO: CA 2277508A

BASIC-ABSTRACT:

NOVELTY - The driving mechanism has a drive shaft (16) which rotates a driving block (20). A cam (22) is mounted for rotation to the driving block and is received in a slot or a follower (26). As the cam rotates, it rolls backwards and forwards in the slot and causes the follower to rotate. A connecting rod (28) is affixed to the follower and is rotated by it. The connecting rod rotates about an axis parallel to, but offset from, the axis about which the drive shaft rotates.

DETAILED DESCRIPTION - The rate of rotation of the drive shaft is unvarying whereas the connecting rod rotates at a varying rate. A crank (32) is fixed to the connecting rod and imparts reciprocating motion to the tray (12). A link can be substituted for the cam.

USE - As a drive mechanism for a shaking tray.

ADVANTAGE - The way in which the tray reciprocates can be adjusted, so that breakable products can advance smoothly with minimal breakage.

DESCRIPTION OF DRAWING(S) - The drawing shows a perspective view of the driving mechanism.

Tray 12

Drive shaft 16

Driving block 20

Cam 22

Follower 26

Connecting rod 28

Crank 32

ABSTRACTED-PUB-NO: US 6415912B

EQUIVALENT-ABSTRACTS:

NOVELTY - The driving mechanism has a drive shaft (16) which rotates a driving block (20). A cam (22) is mounted for rotation to the driving block and is received in a slot or a follower (26). As the cam rotates, it rolls backwards and forwards in the slot and causes the follower to rotate. A connecting rod (28) is affixed to the follower and is rotated by it. The connecting rod rotates about an axis parallel to, but offset from, the axis about which the drive shaft rotates.

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Follower 26

Connecting rod 28

Crank 32

CHOSEN-DRAWING: Dwg.1/12

TITLE-TERMS: DRIVE MECHANISM CAUSE POTATO CHIP CORN FLAKE SIMILAR ADVANCE SHAKE TRAY PRODUCE STAGE ROTATING DRIVE BLOCK CAM MOUNT DRIVE BLOCK RECEIVE SLOT FOLLOWER

DERWENT-CLASS: Q35

SECONDARY-ACC-NO:

Non-CPI Secondary Accession Numbers: N2001-151172

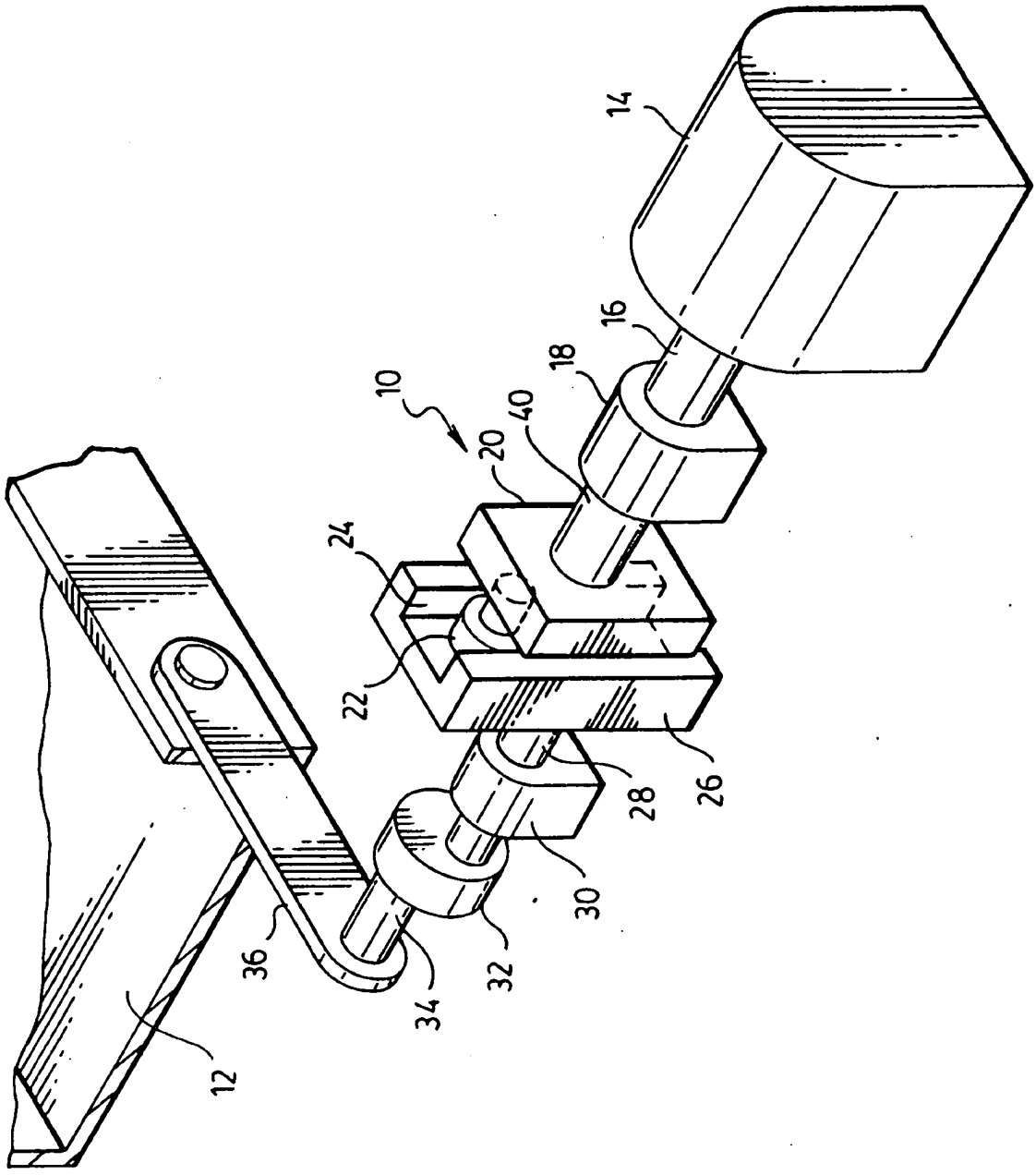


FIG.1.

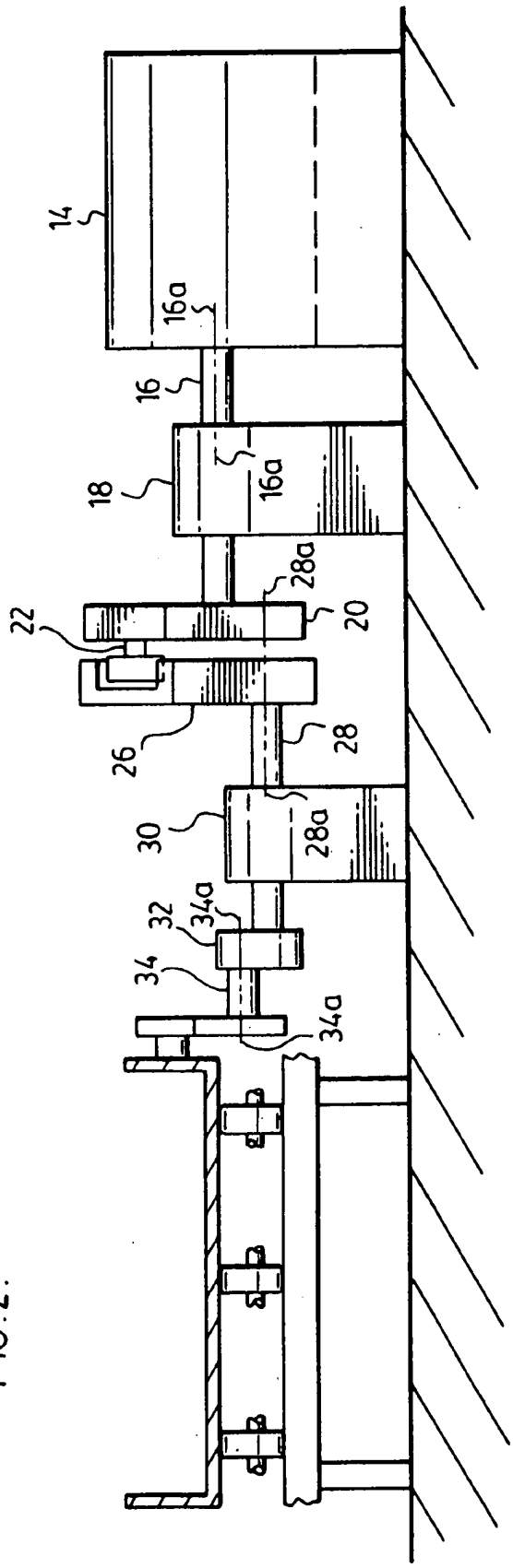


FIG.2.

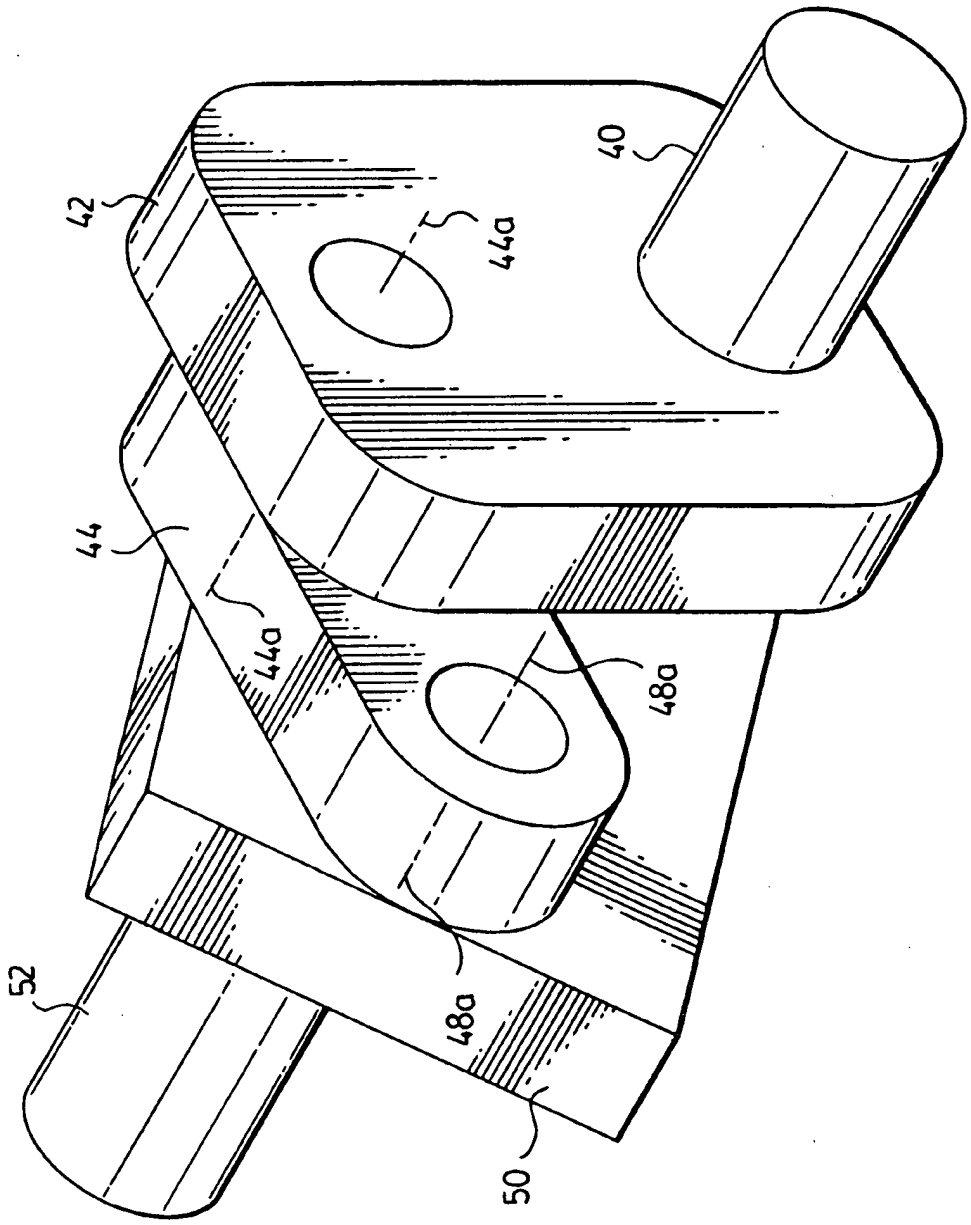


FIG. 3.

FIG. 4.

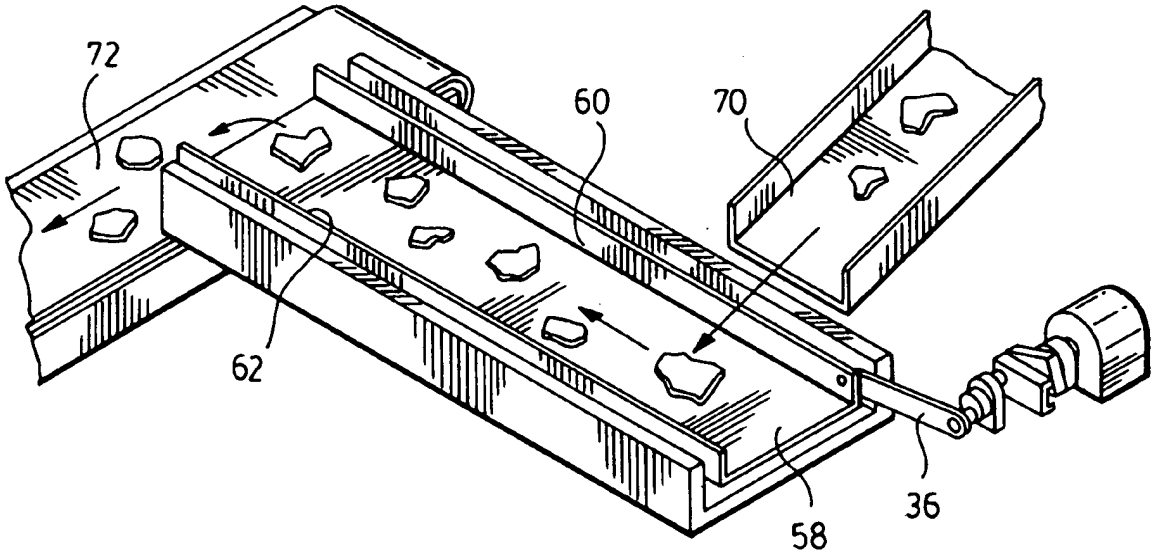


FIG. 5.

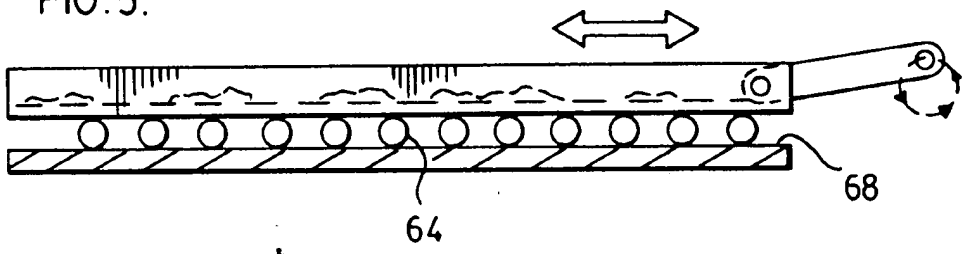


FIG. 6.

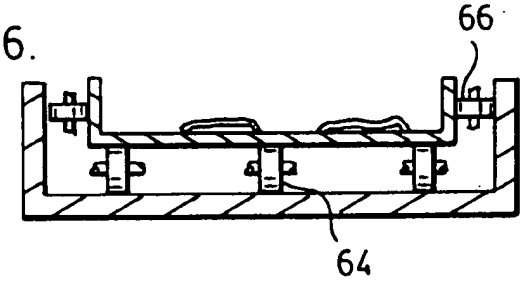


FIG. 7.

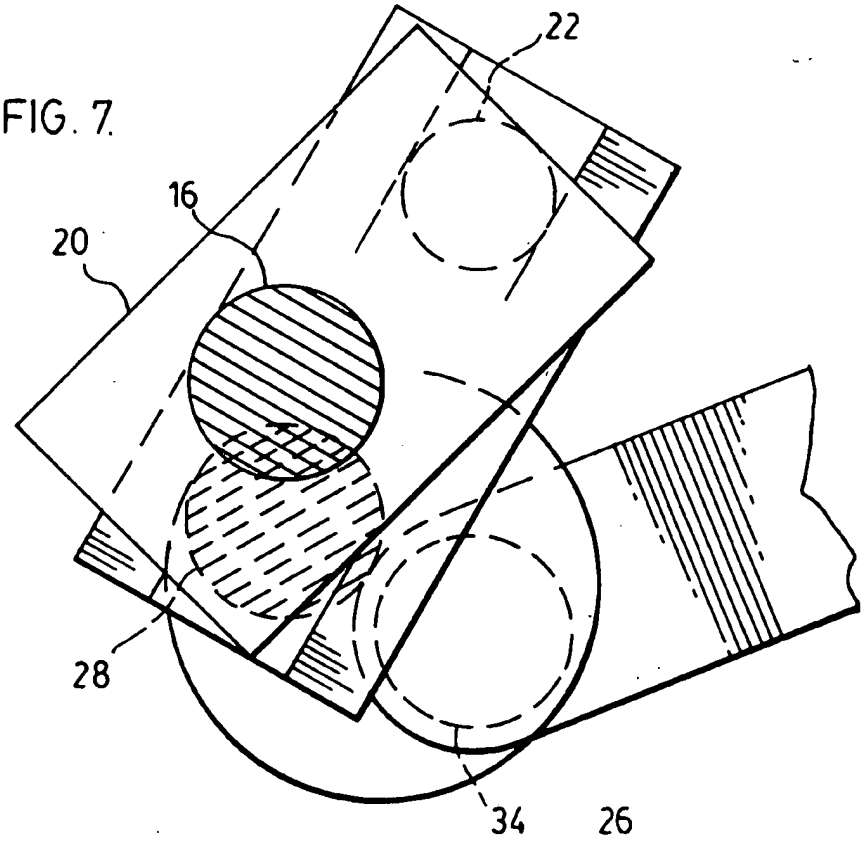


FIG. 8.

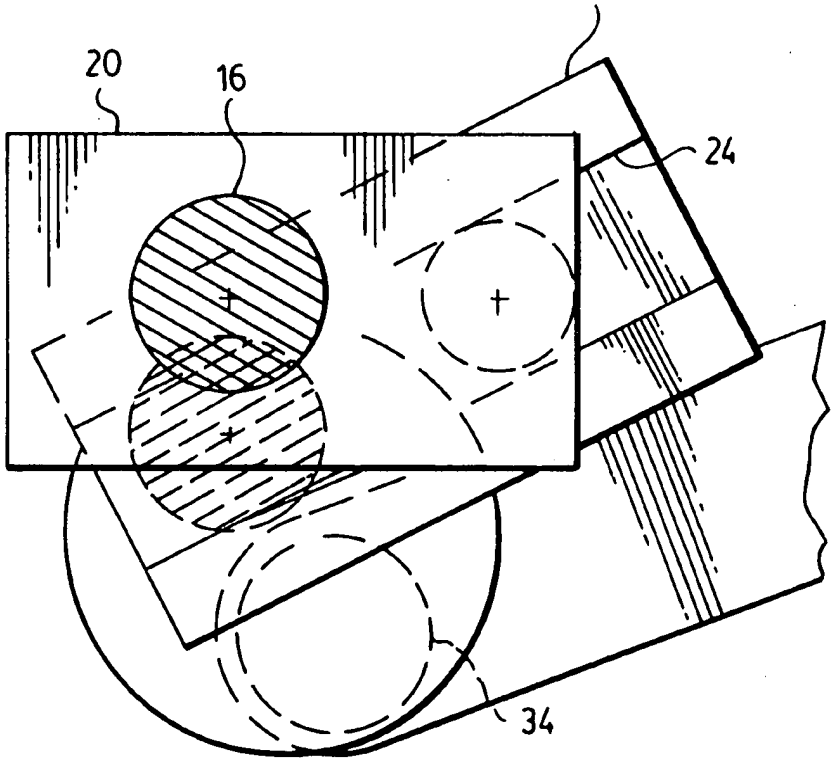


FIG. 9.

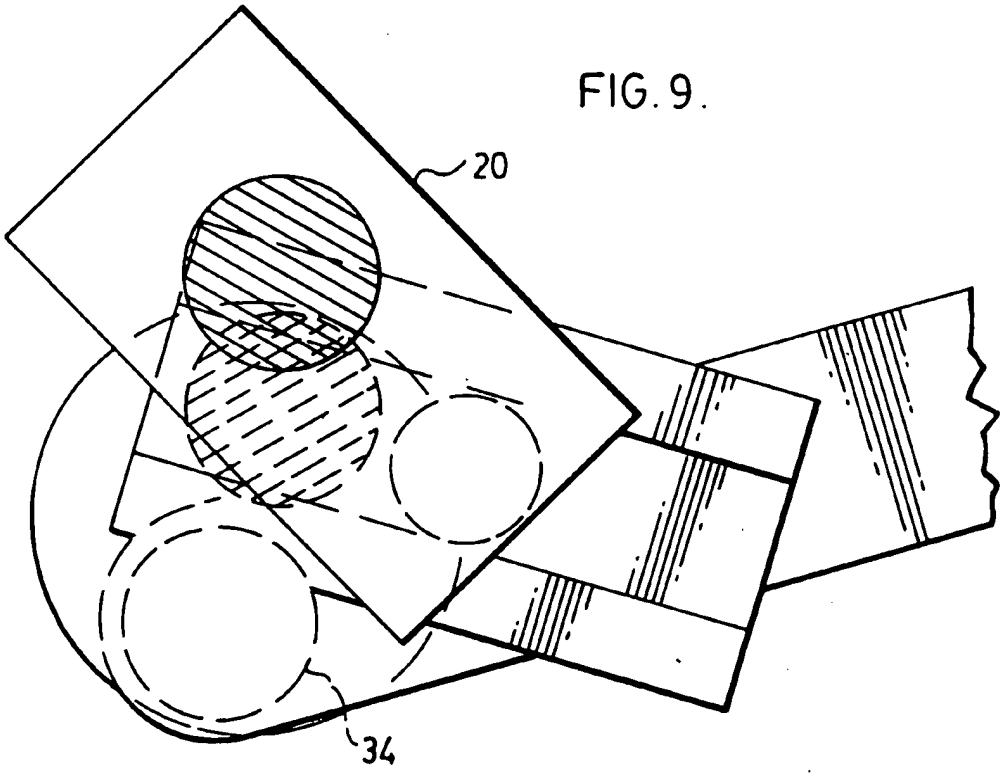


FIG. 10.

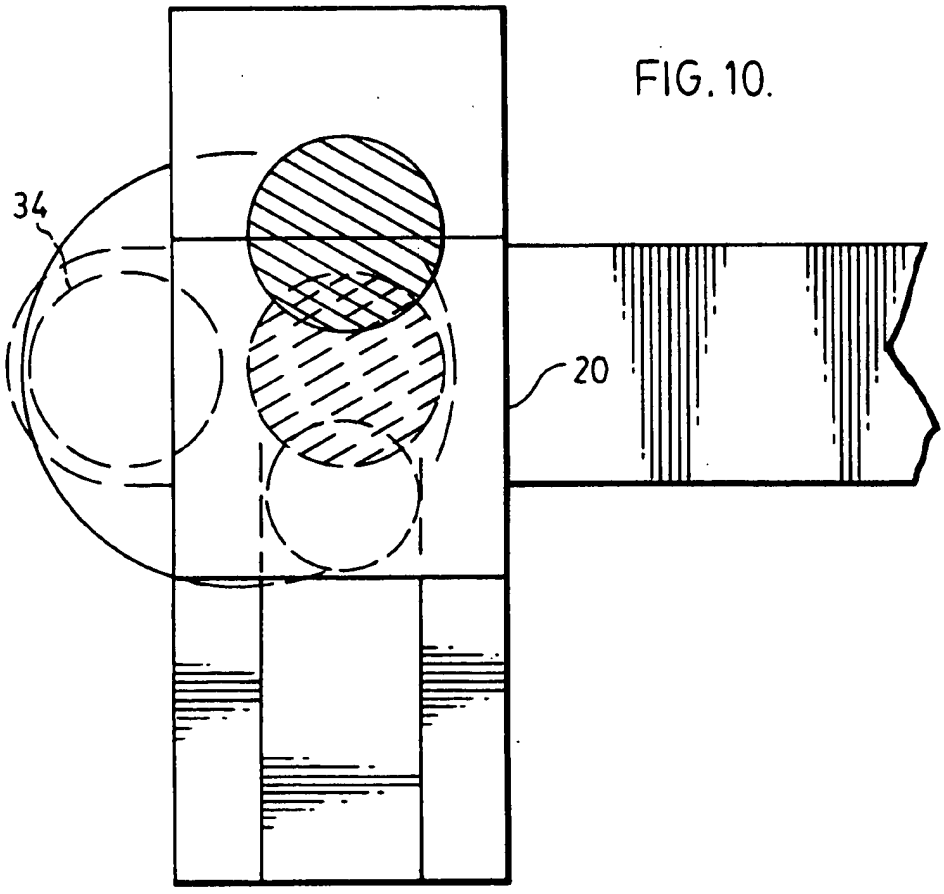


FIG. 11.

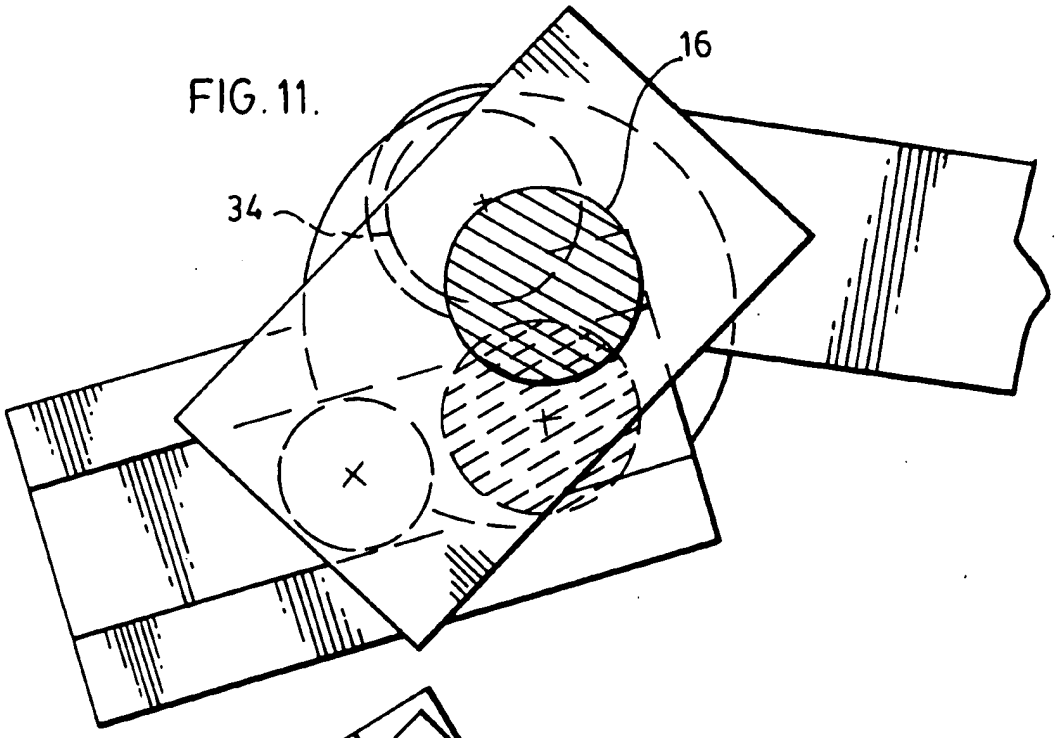
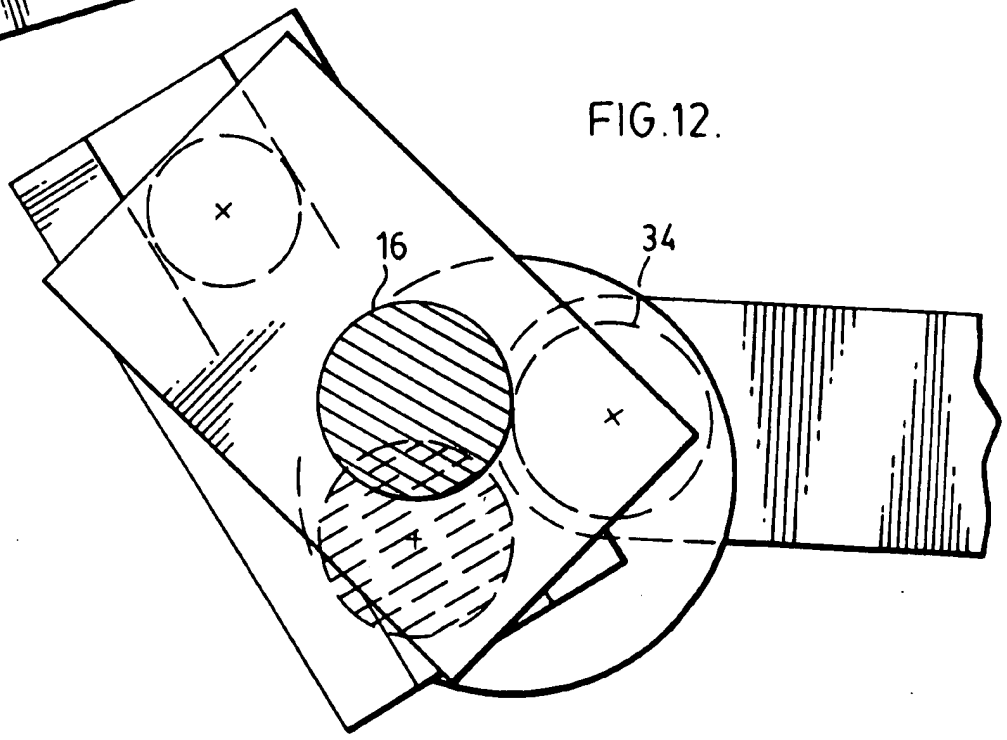


FIG. 12.



BACKGROUND OF THE INVENTION

This invention relates to an apparatus for causing material to advance from one stage to the next in a manufacturing process. More particularly the invention relates to an apparatus for causing particulate consumables such as potato chips, corn flakes and particulate non-consumables such as pieces of scrap metal to advance on a tray from one stage to the next in the manufacture of a product.

In the manufacture of particulate consumables, conveyors are required to move the product from one step in the process to the next. If the consumable is relatively strong such as rice, sugar, salt, it can usually be moved on conventional vibrating trays but if the product is fragile such as potato chips and corn flakes, such trays will cause the product to break into smaller pieces. The smaller the pieces, the less commercially acceptable is the finished product is.

SUMMARY OF THE INVENTION

The driving apparatus of the present invention causes a shaking tray to reciprocate. There is provision for adjusting the way in which the tray reciprocates so that the tray can made to reciprocate jerkily or smoothly. Thus breakable consumables such as those mentioned above can be caused to advance smoothly on the tray from one stage to the next in their manufacture and from the final step to the bagging or packag-

ing operation. Minimal breakage of the product occurs while it is being moved on the tray.

The apparatus of the invention can be broadly described as a driving apparatus for a shaking tray on which particulate material advances. One embodiment of the driving apparatus comprises a cam rotated by a drive shaft and a follower having a slot formed therein for receipt of the cam. As the cam rotates, it rolls backwards and forwards in the slot and imparts rotation to the follower. A connecting rod is affixed to the follower and is rotated thereby. The connecting rod has an axis of rotation parallel to, but offset from, the axis of rotation of the drive shaft. A crank is affixed to the connecting rod and is operatively connected to the shaking tray for imparting reciprocating motion to the tray.

A second embodiment of the driving apparatus comprises a link which is rotated by a drive shaft and which is rotatable about an axis offset from the axis of rotation of the drive shaft. A follower is rotatably mounted to the link and is caused to rotate by the link as the link is rotated by the drive shaft. A connecting rod is affixed to the follower and is rotated thereby. The connecting rod has an axis of rotation parallel to, but offset from, the axis of rotation of the drive shaft. A crank is affixed to the connecting rod and is operatively connected to the shaking tray for imparting re-

ciprocating motion to the tray.

DESCRIPTION OF THE DRAWINGS

The apparatus of the invention is described with reference to the accompanying drawings in which:

Figure 1 is a perspective view of components of the first embodiment of the driving apparatus of the invention;

Figure 2 is an elevation of the components illustrated in Figure 1;

Figure 3 is a perspective view, in enlarged scale, of a portion of the second embodiment of the driving apparatus of the invention;

Figure 4 is a perspective view, in smaller scale than that of the preceding Figures, of the driving apparatus illustrated in Figures 1 and 2 together with a tray which is reciprocated by the driving apparatus;

Figure 5 is an elevation of the tray;

Figure 6 is an end view of the tray; and

Figures 7 to 12 are enlarged fragmentary end views of the components of the first embodiment of the driving apparatus as the drive shaft rotates;

Like reference characters refer to like parts throughout the description of the drawings.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference to Figures 1 and 2, the driving apparatus of the invention, generally 10, is shown in conjunction with

a tray 12. The driving apparatus includes a motor 14 which rotates a drive shaft 16. The shaft is mounted in bearings in housing 18 and is connected to a rotating driving block or member 20.

A cam 22 is mounted in bearings on the driving block and is positioned eccentrically with respect to the axis of rotation 16a-16a of the drive shaft. The cam is accommodated in a vertically extending slot 24 formed in a driven block or follower 26.

The follower is affixed to a connecting rod 28. The connecting rod is mounted in bearings in housing 30 and rotates about an axis of rotation 28a-28a. That axis is offset from the axis of rotation 16a-16a of the drive shaft but is parallel to it.

A crank 32 is affixed to the connecting rod 28. A wrist pin 34 is affixed to the crank and is mounted in bearings in an arm 36. The arm is pivotally connected to tray 12.

With reference to Figure 3, a drive shaft 40 is affixed to a rotating driving block or member 42. A link 44 is rotatably mounted in bearings to the block to rotate about axis 44a-44a. The link is also rotatably mounted in bearings to a driven block or member 50 to rotate about an axis 48a-48a. A connecting rod 52 is affixed to the follower.

The axis of rotation 44a-44a of the link is offset from

the axis of rotation of drive shaft 40 and the axis of rotation of the connecting rod 52 is also offset from the axis of rotation of the drive shaft.

The mechanism illustrated in Figure 3 may be substituted for the drive shaft 16, block and follower 20 and 26 and the connecting rod 28 of Figures 1 and 2. Thus, link 44 of Figure 3 substitutes for cam 22 of Figures 1 and 2.

With reference to Figures 4 to 6, the tray has a lower wall 58 and side walls 60, 62. Arm 36 is pivotally connected to side wall 60. The lower wall rests on rollers 64 and the side walls contact side rollers 66 to ensure that the tray remains centred within a stationary bed 68 as it reciprocates.

A first conveyor belt 70 carries particulate material to the tray and deposits it on the lower wall and a second conveyor belt 72 carries material which discharges from the tray.

The position of the components of the first embodiment of the driving mechanism as the connecting rod rotates incrementally is illustrated in Figures 7 to 12. In Figure 7 to 11, the shaft rotates in increments of 45 degrees and in Figure 12, in an increment of 90 degrees from the previous Figure.

With reference first to Figure 7, the driving block 20 is shown in the 2:00 o'clock position with respect to drive shaft 16 and the cam 22, being connected to the driving block is

likewise in the 2:00 o'clock position. The wrist pin 34 rotates about the connecting rod 28 and is shown in the 4:00 o'clock position.

It will be noted in Figure 7 that the axes of the drive shaft 16, the connecting rod 28, and the wrist pin 34 are all offset from each other. It should also be noted that the drive shaft and connecting rod rotate about their own axes but the wrist pin does not. The pin is affixed to the crank and does not rotate about its axes. It does however rotate about the axis of the connecting rod.

In Figure 8, the drive shaft 16 has rotated clockwise 45 degrees from the position illustrated in Figure 7 and the driving block 20 has likewise rotated 45 degrees. The cam has rolled toward the left in the slot 24 of follower 26 from the position illustrated in the previous Figure and the wrist pin 34 has rotated about 22 degrees from the position illustrated in Figure 7.

In Figure 9, driving block 20 has rotated a further 45 degrees and is now in the 4:00 o'clock position. The wrist pin 34 has rotated about 30 degrees from the position illustrated in the previous Figure and is now in the 7:00 o'clock position.

In Figure 10 driving block 20 is now in the 6:00 o'clock position but wrist pin 34 has rotated 90 degrees from the

position illustrated in the previous Figure. Thus a rotation of 45 degrees of the drive shaft has caused a 90 degree rotation of the wrist pin.

In Figure 11, drive shaft 16 has again rotated about 45 degrees and caused a 90 degree rotation of wrist pin 34 but in Figure 12 the reverse has occurred. Drive shaft 16 has rotated 90 degrees from the position illustrated in the previous Figure but wrist pin 34 has rotated only about 45 degrees. As the drive shaft rotates a further 90 degrees from the position illustrated in Figure 12 to the position illustrated in Figure 7, the wrist pin rotates only about 45 degrees.

Thus rotation of the drive shaft at a unvarying rate causes a varying rate of rotation of the wrist pin. At times the wrist pin rotates more slowly and at other times it rotates more quickly. Such uneven movement of the wrist pin causes the tray to move in a similar manner and such movement causes particles on the tray to advance when the tray is moving slowly forward and to remain stationary when it is jerked backward.

The operation of the drive mechanism may be summarized as follows. As the drive shaft rotates, so too does the cam. The cam also rolls backwards and forward in the slot. Such motion causes the follower to rotate but the rate of rotation of the follower is irregular because of the offset between the axes

of the drive and connecting rods. This irregular movement causes a like movement in the wrist pin.

The irregularity in the movement of the wrist pin can be altered by adjustment in the spacing between the axes of the drive and connecting rods and the spacing between the axes of the output and wrist pins. Thus if the movement is so violent or jerky that the particles on the tray are damaged, the spacing can be altered to reduce the jerkiness or violence.

The wrist pin thus rotates relatively slowly in one direction then rapidly in the opposite direction and such movement causes the tray to reciprocate rapidly in one direction and slowly in the opposite. Such movement will cause particulate material on the tray to move down the tray with little damage to the material.

It will be understood of course that modifications can be made in the preferred embodiments illustrated and described herein without departing from the scope and purview of the invention as defined in the appended claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A driving apparatus for a shaking tray on which particulate material advances comprising: a drive shaft which rotates about an axis of rotation; a cam rotatable about an axis offset from the axis of rotation of said drive shaft and being caused to rotate by said drive shaft; a follower having a slot formed therein for receipt of said cam, said cam as it rotates, rolling backwards and forwards in said slot and imparting rotation to said follower; a connecting rod affixed to said follower and rotated thereby, said connecting rod having an axis of rotation parallel to, but offset from, the axis of rotation of the drive shaft; a crank affixed to said connecting rod and operatively connected to the shaking tray for imparting reciprocating motion to the tray.

2. A driving apparatus for a shaking tray on which particulate material advances comprising: a drive shaft which rotates about an axis of rotation; a link which is rotated by said drive shaft and which is rotatable about an axis offset from the axis of rotation of the drive shaft; a follower rotatably mounted to the link and caused to rotate thereby as said link is rotated by said drive shaft; a connecting rod affixed to the follower and rotated thereby, said connecting rod having an axis of rotation parallel to, but offset from,

the axis of rotation of said drive shaft; a crank affixed to said connecting rod and operatively connected to the shaking tray for imparting reciprocating motion to the tray.

3. The driving apparatus as claimed in claim 1 further including a wrist pin affixed to said crank; an arm to which said wrist pin is rotatably mounted, said arm being rotatably mounted to said tray, said wrist pine rotating about the axis of rotation of said connecting rod and imparting reciprocating motion to the tray.

4. A driving apparatus for a shaking tray on which particulate material advances comprising: a drive shaft which rotates about an axis of rotation; a rotating member connected for rotation to the drive shaft; a cam connected for rotation to said rotating member and having an axis of rotation offset from the axis of rotation of said drive shaft; a follower having a slot formed therein for receipt of said cam and as said cam rotates, said cam rolls backwards and forwards in said slot and imparts rotation to said follower; a connecting rod affixed to said follower and rotated thereby, said connecting rod having an axis of rotation parallel to, but offset from, the axis of rotation of said drive shaft; a crank affixed to said connecting rod; a wrist pin mounted to said crank, said connecting rod causing said crank to rotate and said crank, in turn, causing said wrist pin to rotate, the

axis of rotation of said connecting rod being parallel to, but is offset from, the axis of said wrist pin; and an arm rotatably connected to said wrist pin and being pivotally connected to the tray for imparting reciprocating motion to the tray.